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Forensic Examination of Transferred Fragrances Using Thin Layer Chromatography

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Abstract

As we all know, perfumes are worn daily by both men and women around the world. Transmission between a person and the fabric is one of the main implications of using perfume. The main objective of this research was to perform a qualitative and quantitative analysis and the study of the effect of temperature and time. As is well known, Locard's exchange principle shows that microscopic material will exchange whenever two objects come in contact. Of course, this also includes fibers and other little fragments. When the body responds to higher temperatures and climates, a change in smell occurs. Your body opens your pores to release sweat when you get hot, further stimulating the perfume's aroma molecules. Because of this, perfume evaporates more quickly in hotter climates.

Keywords: VOC; Fragrances analysis; fibers; Trace evidence; Clothing; Sexual assault.

Introduction

The first people to use perfumes for religious ceremonies were the ancient Egyptians, who did so 5000 years ago. People have used herbs and spices for centuries, including almonds, coriander resin, and flowers [1]. The word "perfume" comes from the Latin word "perfumer," which means "to smoke." Perfumery, also known as the art of making perfumes, was developed by the Romans and Arabs and began in ancient Egypt. The first individuals to ever employ perfume for personal enjoyment were the Egyptians.

A perfume is a necessary and widely used cosmetic item that people use to have a pleasant aroma and feel fresh. To provide a pleasing smell, it is made up of aromatic chemicals such as fixatives, essential oils, and solvents. Three separate ingredients—essential oils, solvents, and fixatives—go into its preparation. The fragrance is the most well-known component of perfume. They can be broadly categorized based on the perfume essence, the concentration of the scent elements, and how long they stay. Fragrances are microscopic, visually imperceptible evidence. This investigation tries to solve the crucial problem of a dearth of tangible proof. Rape cases are now more willingly reported. Various factors that affect how closely the victim and suspect are related have been used to explain both the police-recorded cases and those that resulted in prosecution. Locard's exchange principle, a widely recognized concept, states that microscopic materials exchange when two objects touch. This principle naturally encompasses fibers and tiny fragments as well. [2]. In hot weather and environment, your body sweats more, opening pores and activating perfume molecules, causing the scent to evaporate quickly.

The category of trace evidence includes scents, which are undetectable by the naked eye. When there is an interaction between two separate components of those perfumes that can transfer, they are frequently utilized by both men and women [3,4]. The likelihood of contact may be determined by analyzing pertinent scent components. Benzaldehyde, methylene chloride, ethyl acetate, linalool, camphor, limonene, and other chemicals are among the most widely used components in perfumes. In terms of concentration, ethyl alcohol, which makes up 60% of all perfumes, is known as the principal ingredient. It is a diluted product, making it simple to apply to the skin. Natural plant oils make up the three primary parts of organic perfumes. It contains distilled water, aromatic oils, and natural alcohol made from wheat, corn, grapes, or sugarcane. About 3,059 different chemicals are used in the formulation of fragrances. Essential oils are natural products or complex mixtures of hundreds of chemical compounds that can be grouped into four major groups. Aliphatic compounds, terpenes, terpene derivatives, benzene derivatives, and miscellaneous compounds [3]. They represent the base of perfume production. However, in the analysis, certain types of perfume can be examined from which plant species used essential oils for their product [2].

Essential oils and plant materials containing such oils are natural products of great economic importance. A few essential oils or pure compounds isolated such oils are used directly as medicines due to their antimicrobial, antifungal, or anti-inflammatory.

Thin Layer Chromatography (TLC) within a short period of time has become the most important technique for the identification, Characterization, and determination of chemical compounds as well as complex mixtures. This technique can analyze chemical substances of natural and synthetic origin [2].

What exactly are volatile compounds

Organic chemical molecules called volatile organic compounds (VOCs) readily evaporate at ambient temperature. These are commonly utilized at home and at business and are easily airborne. All living organisms contain organic components, which are known as carbon-containing substances. They include substances like hydrogen, oxygen, fluorine, chlorine, and bromine. They are poorly soluble in water and have a high vapor pressure [9]. They are classed into oxygenated, nitrogenous, aromatic hydrocarbons, alcohols, ethers, and esters based on their molecular structure and functional groups. VOCs are also found in different kinds of fuels and hydraulic fluids.

Ingredients of a perfume

78 to 95 percent ethyl alcohol, essential oils, and other ingredients make up a perfume. The rate of evaporation of a fragrance ingredient in a perfume determines how long it will last. Additionally, they have various fragrance categories, such as "floral," "woody," or "citrus" notes. Modern perfumes have distinctive properties including a heightened scent because they comprise a variety of synthetic ingredients. Cardamon, jasmine, lavender, sandalwood, and nutmeg are a few examples of common plant sources for fragrances. There are different types of methods that are employed in perfume manufacturing. For instance, materials containing fragrant compounds are heated during distillation before being transformed into a vapor and then collected. Another method is maceration, which involves soaking uncooked items in liquid to extract the scents. Materials must be compressed to extract the aromatic oils.

What is the history of perfume?

Extrait de parfum: Another name for this is parfum. This kind of perfume contains the most smell. Its concentration ranges from 15 to 40 percent, whereas that of other scents is between 20 and 30 percent. It, therefore, lasts the longest, which is roughly 6 to 8 hours. Moreover, because of the great concentration, its price is also quite expensive.

i. **Eau de perfume:** Following perfume, Eau de parfum has the next-highest fragrance concentration. Between 15% and 20% of it is covered in fragrance. It persists for 4 to 5 hours because of its slightly low concentration. Consequently, it costs less than parfum. The ideal use is as nightwear.

ii. **Eau de toilette:** The scent concentration in eau de toilette ranges from five to fifteen percent. This lasts for two to three hours and is less expensive than the previous two treatments. Most appropriate for daily use.

The makeup of perfume

These are primarily made up of- Essential Oils: made from synthetic aromatic compounds

Thin layer chromatography

Thin-layer chromatography quickly became the go-to technique for categorizing, identifying, and determining chemical compounds and complex combinations. The analysis of chemical substances, both natural and synthetic, can be done using this technique. Therefore, the current study aimed to identify and validate using thin-layer chromatography the essential oil components used for perfume manufacture.

Material and Methods

In this study, five different commercial perfumes were taken randomly, marked as samples 1,2,3,4, and 5. The contents written on the label (declaration)of each perfume give the presence of chemicals that are integral components of different essential oils derived from various plant materials.

The ingredients listed on the label for:

i. Perfume No. 1 were Linalool, Geraniol, Isoeugenol, Limonene, Citral, and Citronelal.

ii. Perfume No. 2 were Linalool, Geraniol, Citral, and Citronelal.

iii. perfume No. 3 were Linalool, Geraniol, Eugenol, Limonene, Citral and Citronelal.

iv. Perfume No. 4 were Linalool, Geraniol, Isoeugenol, Limonene, Citral, Citronelal and Farnesol.

v. Perfume No. 5 were Linalool, Geraniol, Limonene, Citral and Citronelal.

Sample Preparation

Silica gel aluminum plates, (F 254,20 cm), were used. Three solvent systems were prepared and labelled as solvent systems A, B, and C respectively.

Solvent system A-Ethyl acetate

Solvent system B- Toluene

Solvent system C- Chloroform

1 ml of different essential oils was diluted with toluene and 5 microliters were used for TLC. According to Wagner & Bladt [4], commercial perfumes were produced in toluene at a ratio of 1:30.

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To separate the constituents from the essential oils and perfumes, silica gel was employed as a TLC adsorbent and toluene-ethyl acetate at a ratio of 93:7 as the mobile phase. Sulfuric acid was utilized as a spray reagent while the identified components were seen under UV light at 254 and 366 nm. However, the plates produced with chloroform (Melissae folium) and dichloromethane (*Caryophylli aetheroleum*, *Lavandula aetheroleum*) can be utilized as solvent systems for medications and their essential oils. The mobile phase is acceptable for the analysis and comparison of all significant essential oils. Commercial perfumes were made with a 1:30 ratio of toluene (Figure 1).

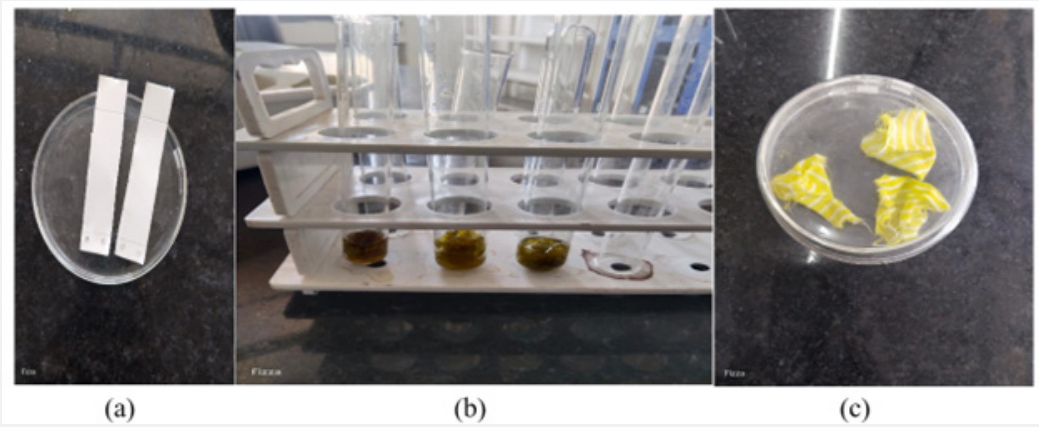

Figure 1: *Aetheroleum rosae* (geraniol, citronellol), *Aetheroleum melissae* (citral and citronelal), *Aetheroleum caryphylli* (eugenol), and *Aetheroleum aurantii floris* (farnesol) were the plant extracts, and essential oils used as the base for perfume production and chromatographic analysis.

Results and Discussion

Toluene-ethyl acetate (93:7) was used as the developing solvent in preliminary investigations on five randomly chosen scents to identify and confirm the nature of the ingredients present (as stated on the label), and to verify and confirm the type of ingredients present (reported on the labels of five randomly selected perfumes). *Aetheroleum citri, Aetheroleum rosae*, *Aetheroleum lavandulae*, *Aetheroleum caryophylli*, and *Aetheroleum chamomilla* essential oils were among the plant materials that were used in addition. Sulfuric acid and a UV lamp tuned to 254nm are used to visualize TLC. Additionally, all the samples that were tested at 366 nm included linalool, geraniol, citral, and citronellal. Lemon, farnesol, and isoeugenol were found in two samples each, eugenol was found in one sample, and coumarin was found in three samples [5].

Conclusion

The findings of a recent study that examined how VOC was transferred onto fabric were intriguing. The study's main finding was the duration of the VOC period visible on a piece of fabric. The general conclusion of the study was that VOC may be analyzed as a trace element that can be found at different concentrations from fabric to fabric. The examples described above TLC has the ability to separate mixtures of substances of similar structure as perfumes and essential oils. Additionally, it is important to mention that using TLC different perfumes were evaluated for their content declared on the labels provided by the manufacturer. Finally, this was done with a cheap and easy to perform technique.

References

1. Nehal Ahmed MD, Syed Ammar Ahmed, Guntoju, Shaik Naziya, Kathula Supriya (2019) A Review on Perfumery. World Journal of Pharmaceutical Sciences 7(4): 56-68.
2. Kovac-Besovic E, Besovic A, Niksic H (1996) Investigation of chemical substances of essential oils in commercial perfumes by method of thin layer chromatography. Your hosts Macedonian Pharmaceutical Association and Faculty of Pharmacy, Ss Cyril and Methodius University in Skopje 1(30): 511.
3. Oyen LPA, Nguyễn XD (1999) Southeast Plant Resources Asia (No 19). Backhuys Publishers.
4. Wagner H, Bladt S (1996) An atlas of thin layer chromatography for plant medicine analysis. Science & Business Springer, Germany.
5. Do TKT, Hadji-Minaglou F, Antoniotti S, Fernandez X (2015) Authenticity of essential oils. TrAC Trends in Analytical Chemistry 66: 146-157.

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